FIG. 1

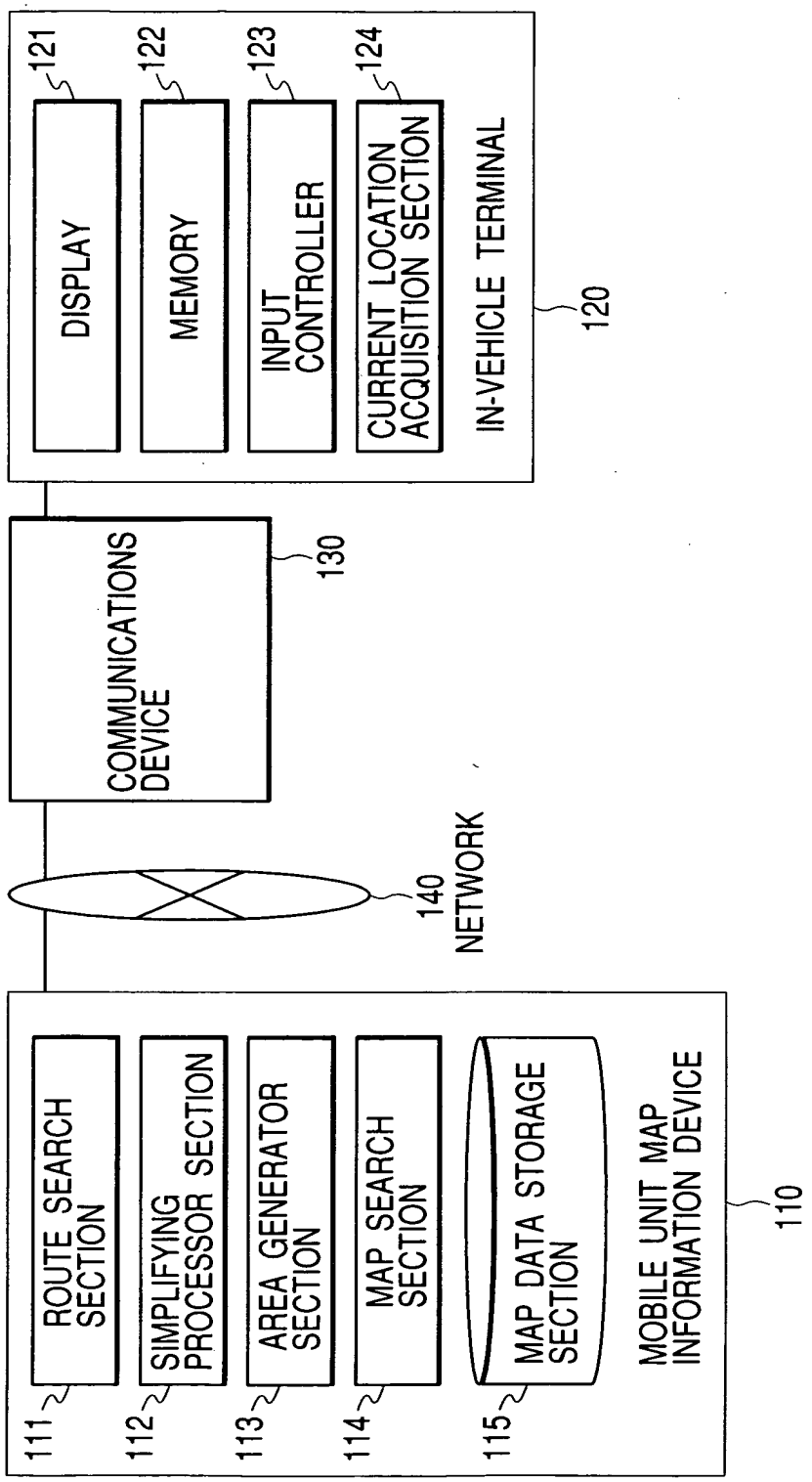

MOBILE UNIT MAP INFORMATION DEVICE
110
ROUTE SEARCH SECTION
111
SIMPLIFYING PROCESSOR SECTION
112
AREA GENERATOR SECTION
113
MAP SEARCH SECTION
114
MAP DATA STORAGE SECTION
115
NETWORK
140
COMMUNICATIONS DEVICE
130
IN-VEHICLE TERMINAL
120
DISPLAY
121
MEMORY
122
INPUT CONTROLLER
123
CURRENT LOCATION ACQUISITION SECTION
124

FIG. 2

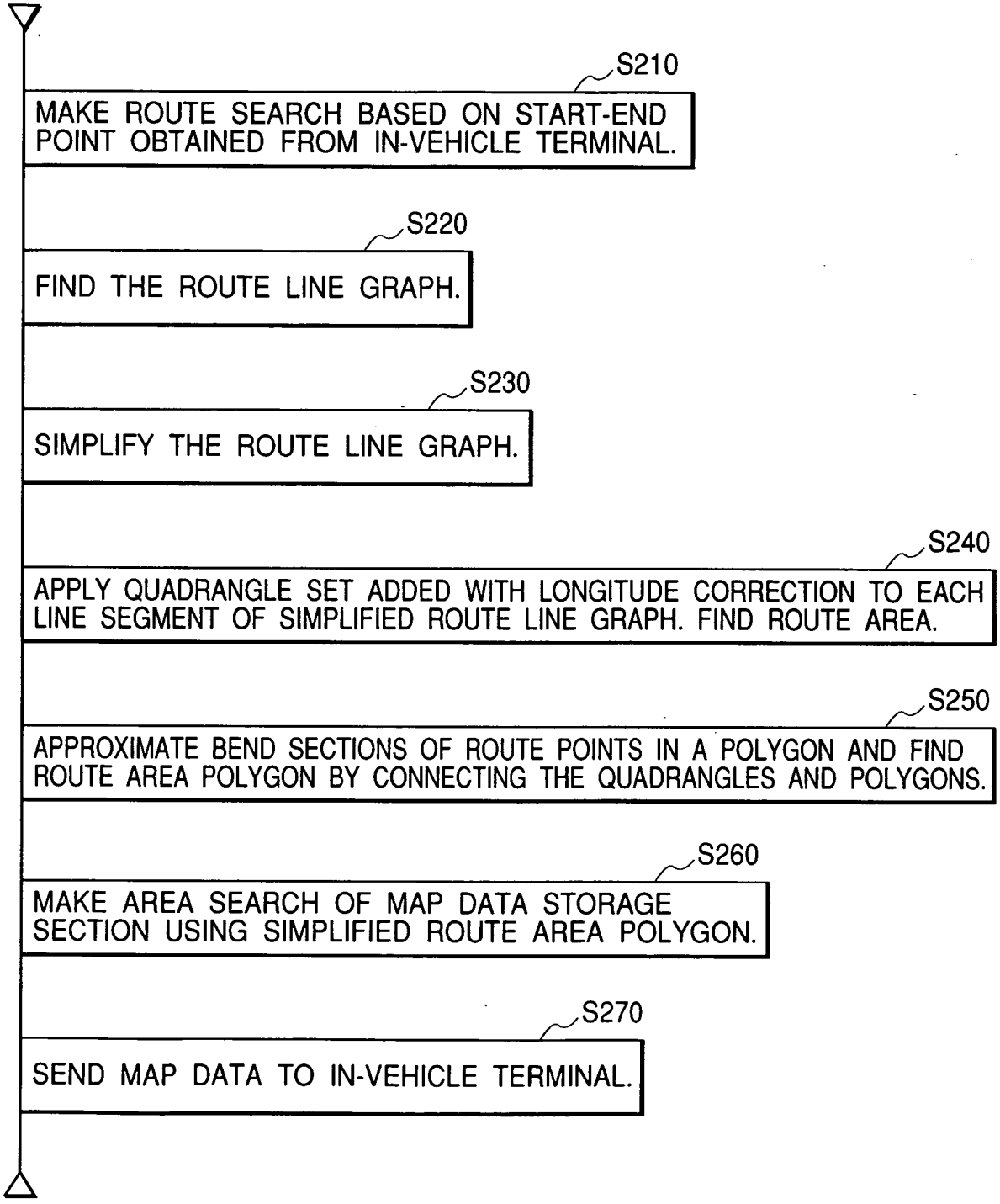

S210
MAKE ROUTE SEARCH BASED ON START-END POINT OBTAINED FROM IN-VEHICLE TERMINAL.
S220
FIND THE ROUTE LINE GRAPH.
S230
SIMPLIFY THE ROUTE LINE GRAPH.
S240
APPLY QUADRANGLE SET ADDED WITH LONGITUDE CORRECTION TO EACH LINE SEGMENT OF SIMPLIFIED ROUTE LINE GRAPH. FIND ROUTE AREA.
S250
APPROXIMATE BEND SECTIONS OF ROUTE POINTS IN A POLYGON AND FIND ROUTE AREA POLYGON BY CONNECTING THE QUADRANGLES AND POLYGONS.
S260
MAKE AREA SEARCH OF MAP DATA STORAGE SECTION USING SIMPLIFIED ROUTE AREA POLYGON.
S270
SEND MAP DATA TO IN-VEHICLE TERMINAL.

FIG. 3

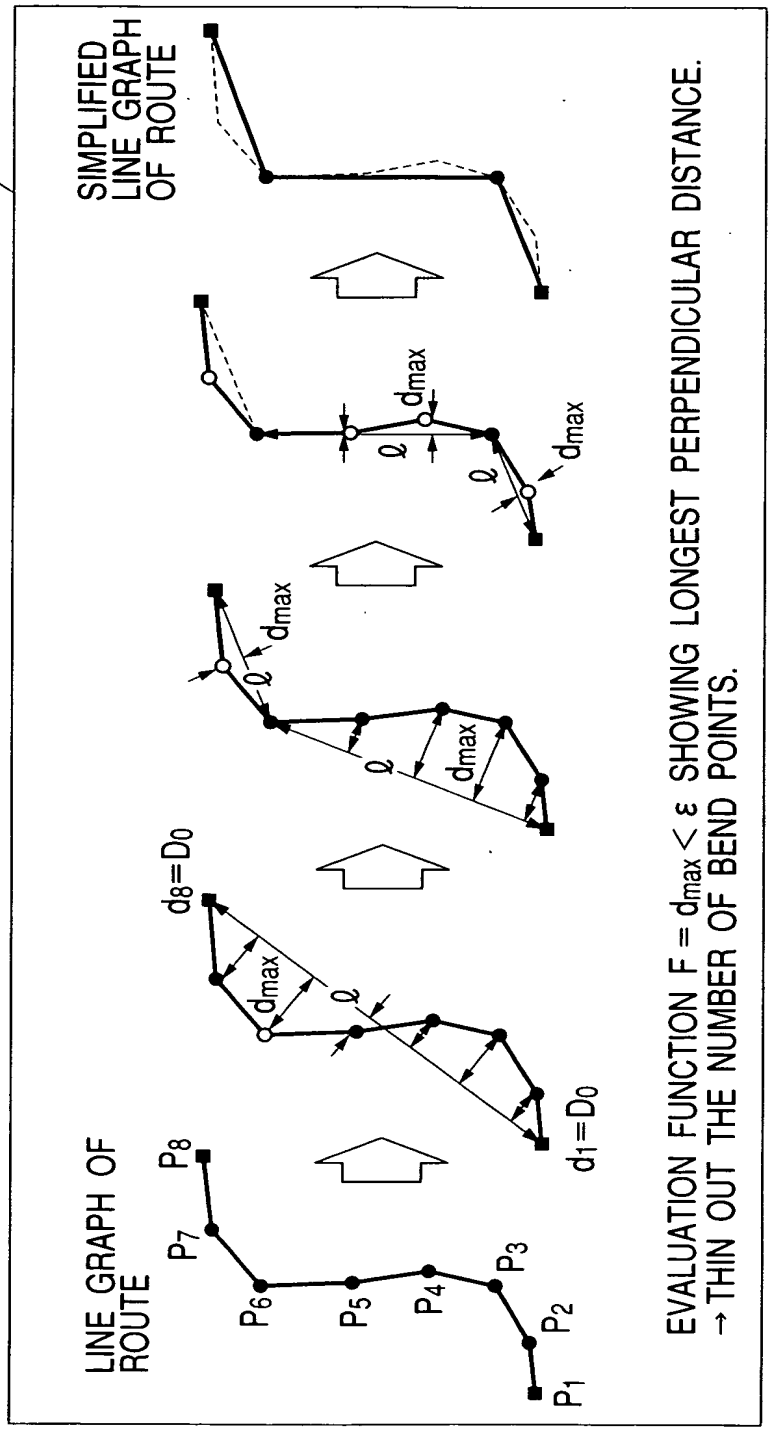
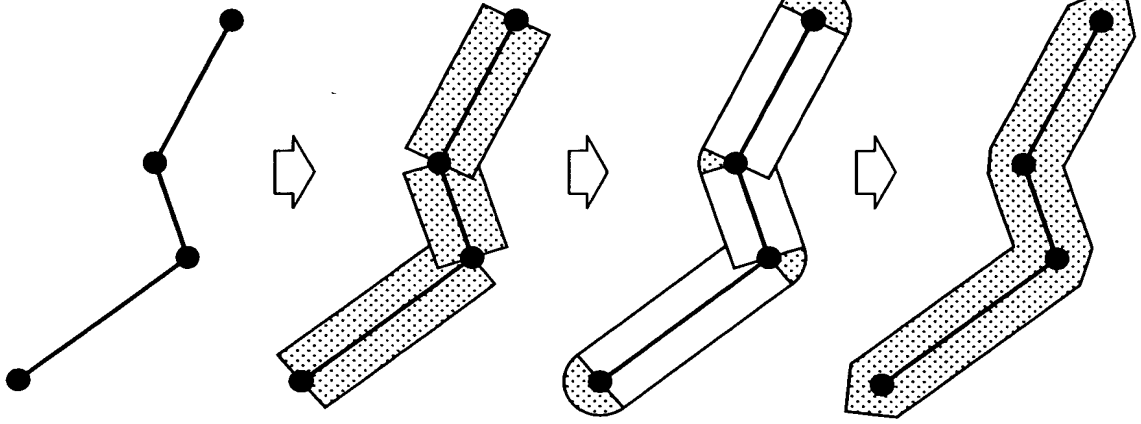

300
LINE GRAPH OF ROUTE
P1
P2
P3
P4
P5
P6
P7
P8
d1=D0
d8=D0
dmax
ε
SIMPLIFIED LINE GRAPH OF ROUTE
EVALUATION FUNCTION F = dmax < ε SHOWING LONGEST PERPENDICULAR DISTANCE.
→ THIN OUT THE NUMBER OF BEND POINTS.

FIG. 4A

410



S411. CORRECT THE LONGITUDE COMPONENT AND SET WIDTH AT BOTH ENDS.

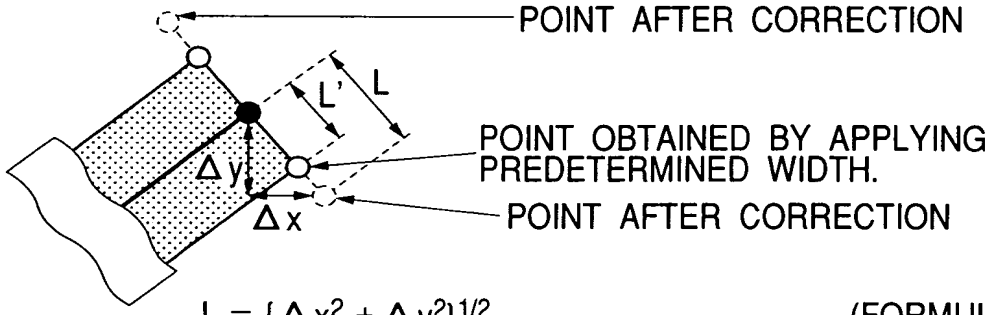
S412. CREATE ARC AT BEND POINT.

S413. APPROXIMATE THE ARC INTO A CORRECTED N SHAPE.

FIG. 4B

420

S411. PROCESSING TO CORRECT LONGITUDE COMPONENT.



$$L = \{\Delta x^2 + \Delta y^2\}^{1/2} \quad \text{----------(FORMULA 421)}$$

$$L' = \{(\cos\theta * \Delta x)^2 + \Delta y^2\}^{1/2} \quad \text{----------(FORMULA 422)}$$

HERE θ IS THE LATITUDE (OR A TYPICAL VALUE FOR LATITUDE)

$$\text{OR, } L' = \{(k * \Delta x)^2 + \Delta y^2\}^{1/2} \quad \text{----------(FORMULA 423)}$$

HERE, k IS THE COEFFICIENT DETERMINED BASED ON THE LATITUDE.

FIG. 5A

500

LATITUDE	TYPICAL VALUE FOR LATITUDE
35°～ 40°	37.5°
40°～ 45°	42.5°
45°～ 50°	47.5°
⋮	⋮

FIG. 5B

510

LATITUDE	COEFFICIENT k
35°～ 40°	0.79
40°～ 45°	0.74
45°～ 50°	0.68
⋮	⋮

FIG. 6A

ROAD TABLE 610

ID	TYPE	COORDINATES	NAME
1001	NATIONAL HIGHWAY	{(22, 141), ..., (34, 244)}	NO. 20
1002	METROPOLITAN ROUTE	{(34, 562), ..., (233, 984)}	FUCHU ROUTE
1003	CITY LOAD	{(859, 349), ..., (83, 909)}	
⋮	⋮	⋮	⋮

FIG. 6B

POI TABLE 620

ID	TYPE	COORDINATES	NAME
2001	GS	(234, 533)	SO-AND-SO GASOLINE STAND
2002	SHOP	(163, 499)	ABC STORE
2004	SHOP	(3, 300)	BURGER SHOP
⋮	⋮	⋮	⋮

FIG. 6C

LANDSCAPE TABLE 630

ID	TYPE	COORDINATES	NAME
3001	LAKE/MARSHES	{(22, 141), ..., (34, 244)}	YAMANAKA LAKE
3002	PARK	{(34, 562), ..., (233, 984)}	NATIONAL PARK
3003	RAILWAY	{(859, 349), ..., (83, 909)}	CHUO LINE
⋮	⋮	⋮	⋮

FIG. 7

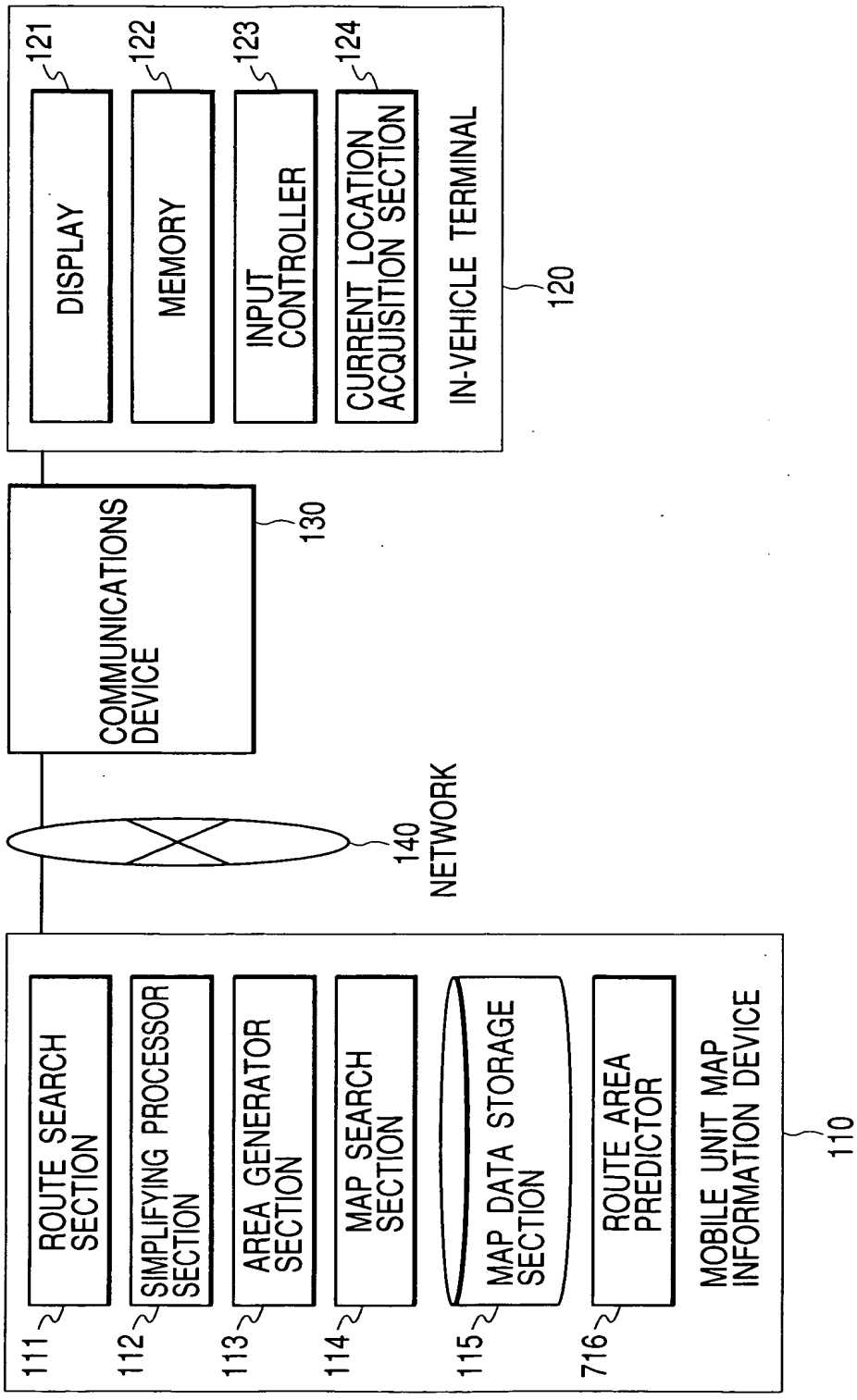

MOBILE UNIT MAP INFORMATION DEVICE
110
ROUTE SEARCH SECTION
111
SIMPLIFYING PROCESSOR SECTION
112
AREA GENERATOR SECTION
113
MAP SEARCH SECTION
114
MAP DATA STORAGE SECTION
115
ROUTE AREA PREDICTOR
716
NETWORK
140
COMMUNICATIONS DEVICE
130
IN-VEHICLE TERMINAL
120
DISPLAY
121
MEMORY
122
INPUT CONTROLLER
123
CURRENT LOCATION ACQUISITION SECTION
124

FIG. 8

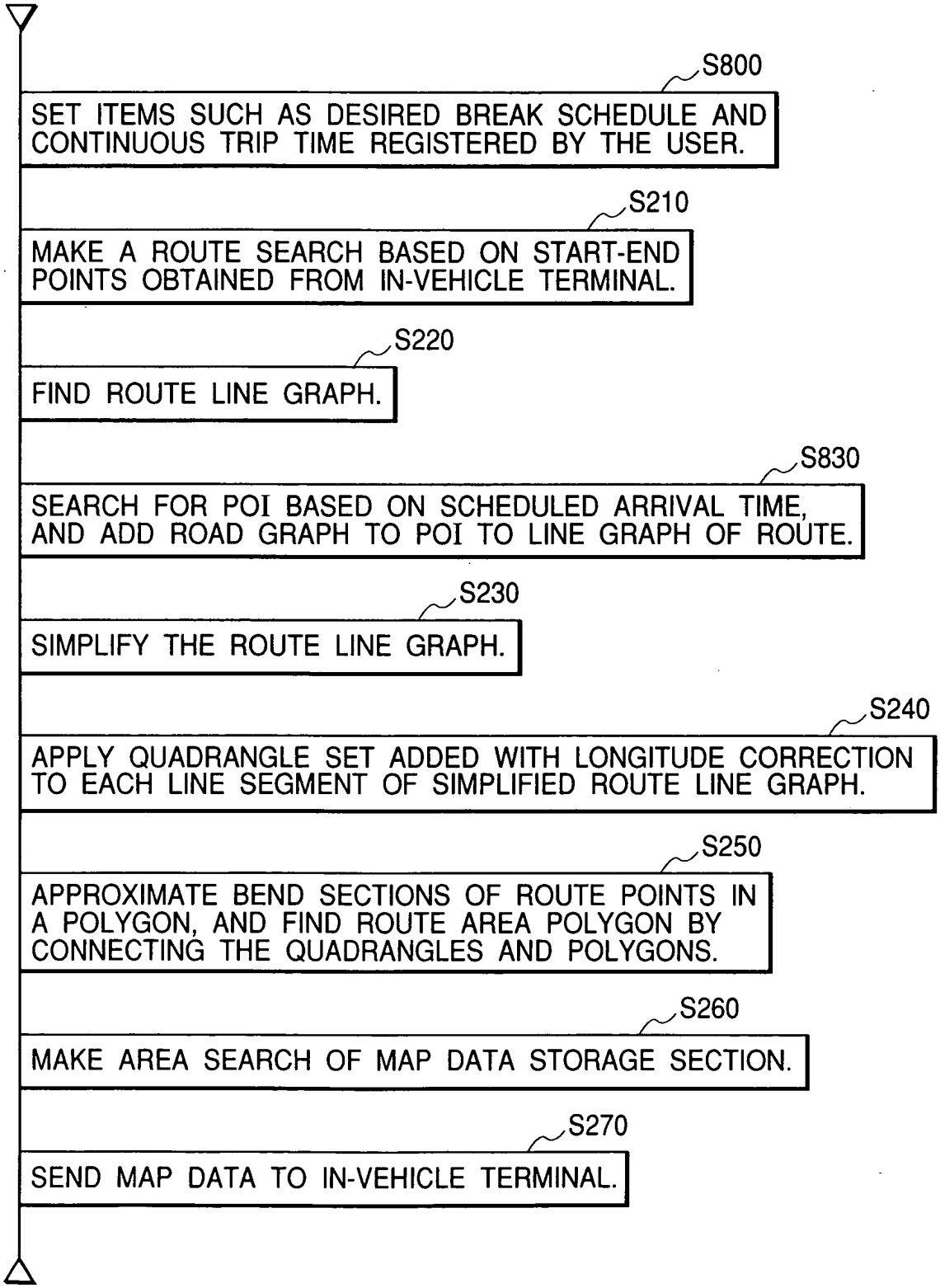

S800
SET ITEMS SUCH AS DESIRED BREAK SCHEDULE AND CONTINUOUS TRIP TIME REGISTERED BY THE USER.
S210
MAKE A ROUTE SEARCH BASED ON START-END POINTS OBTAINED FROM IN-VEHICLE TERMINAL.
S220
FIND ROUTE LINE GRAPH.
S830
SEARCH FOR POI BASED ON SCHEDULED ARRIVAL TIME, AND ADD ROAD GRAPH TO POI TO LINE GRAPH OF ROUTE.
S230
SIMPLIFY THE ROUTE LINE GRAPH.
S240
APPLY QUADRANGLE SET ADDED WITH LONGITUDE CORRECTION TO EACH LINE SEGMENT OF SIMPLIFIED ROUTE LINE GRAPH.
S250
APPROXIMATE BEND SECTIONS OF ROUTE POINTS IN A POLYGON, AND FIND ROUTE AREA POLYGON BY CONNECTING THE QUADRANGLES AND POLYGONS.
S260
MAKE AREA SEARCH OF MAP DATA STORAGE SECTION.
S270
SEND MAP DATA TO IN-VEHICLE TERMINAL.

FIG. 9

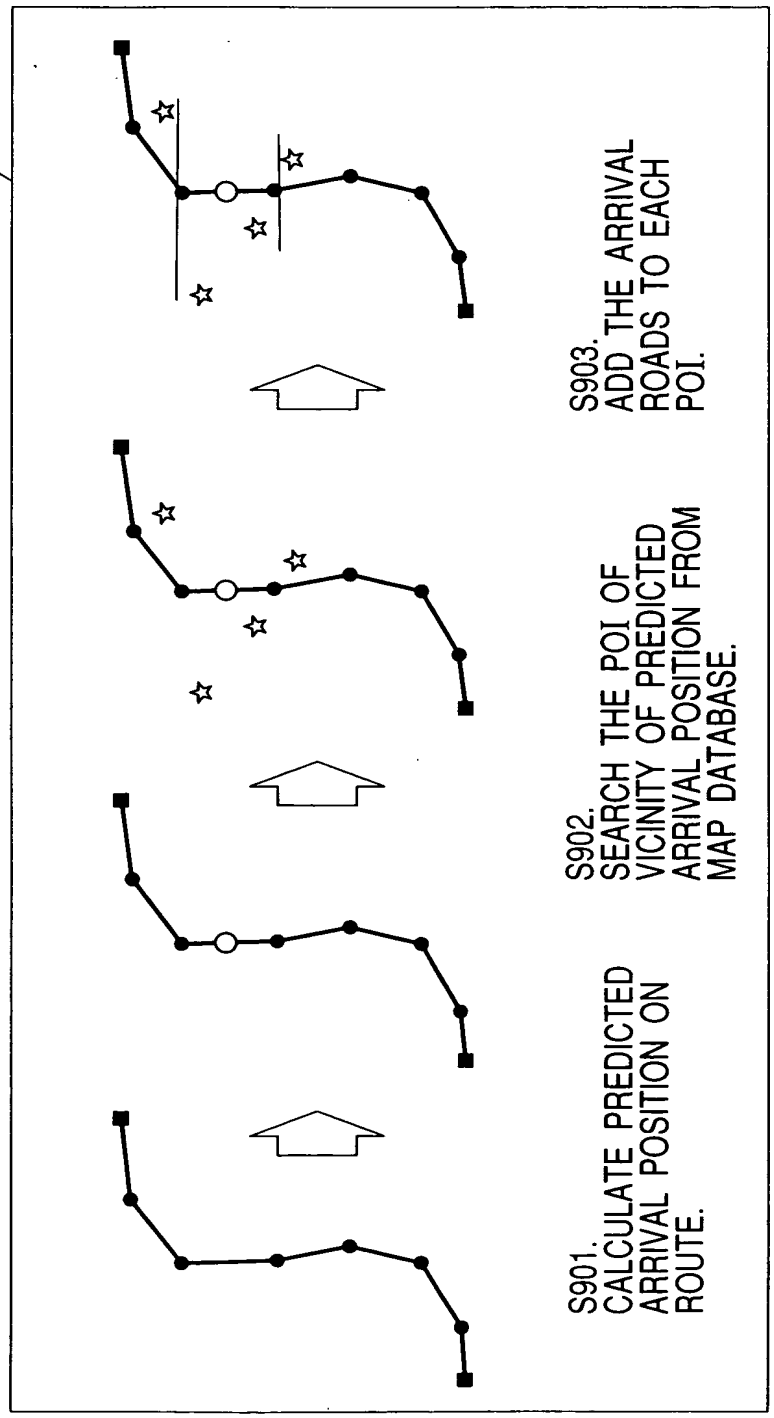

900
S901.
CALCULATE PREDICTED
ARRIVAL POSITION ON
ROUTE.
S902.
SEARCH THE POI OF
VICINITY OF PREDICTED
ARRIVAL POSITION FROM
MAP DATABASE.
S903.
ADD THE ARRIVAL
ROADS TO EACH
POI.

FIG. 10A

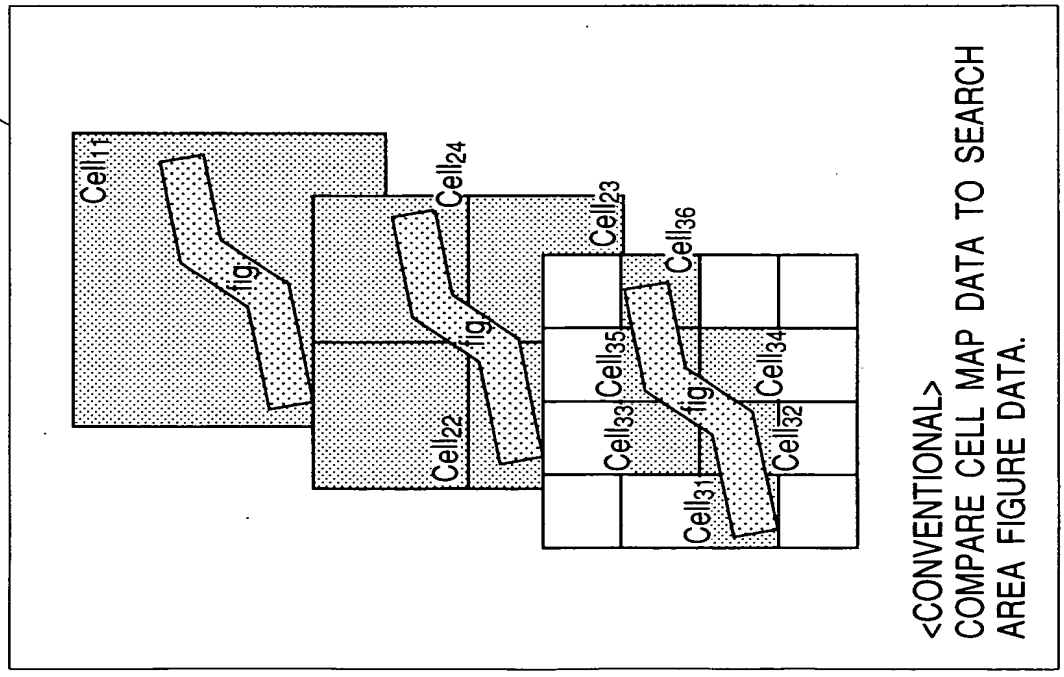


FIG. 10B